Day 1

What is a large biopharmaceutical company? Major company functions and critical roles that marketing and manufacturing are playing in the early stages of drug development.

How to develop marketing forecast and manufacturing strategy during the uncertainty of Phase I and II in drug development.

Pfizer больше чем

AGENDA

- **What determines large biopharmaceutical company classification**
- **What are the major** functions, structures, and interdependencies in a large bipharma
- **Critical roles that marketing and manufacturing are playing in the early stages of drug development.**
- **How to develop marketing forecast and manufacturing strategy during the uncertainty of Phase I and II in drug development**

Why is pharma industry sector so important?

- Traditional For Profit: Typical economics apply to life saving industry
- Charitable Programs: Donations, partnership with WHO, USAID, UNFPA in specific areas
  - Malaria
  - Infection Deseaces
  - Contraceptives

Total sales: 1 TRILLION

Pharmaceutical Company Classifications

Chemically Derived Drugs (Small Molecules)

Life Organisms Derived Drugs (Biologics / Biopharmaceutical)

Pharmaceutical Company (Discovery, Development and Commercialization)

Biotech Company (Discovery and Development)

Biopharmaceutical Company

BioPharma Industry at a Glance

Research Based Pharma

- Develops, manufactures and sells new drug therapies and diagnostic tools
- Top Players are
  - Glaxo Smith Kline,
  - Pfizer, Merck,
  - Aventis,
  - Novartis, Astro Zeneca, J&J
- Total Sales: $1 trillion

Global BioPharma sales in 2014.

Generic Pharma

- Manufactures and sells copies of innovative compounds once their patents have expired (after loss of exclusivity LOE)
- Top Players are
  - Teva,
  - Ranbaxy
  - Sandoz
  - Actavis
  - Bergolak

Major Functions of a Global BioPharma Company (1/3)

Research and Development

Supply (manufacturing and distribution)

Marketing and Commercial Operations

Support Functions

Regulatory, Medical, Finance

Major Functions of a Global BioPharma Company (2/3)

Research and Development

- Engine of Innovation
- Discovery and development of new molecules
- Development of safe and efficacious pharmaceutical products

Includes:

- Discovery (identification of early candidates)
- Drug Safety and drug metabolism
- Pharmaceutical Development
- Clinical development (PK, PD, Safety and Efficacy, human trials)
- Quality

Major Functions of a Global BioPharma Company (3/3)

Manufacturing and Distribution	• Uninterrupted Product Supply to the Customers • Product Supply • Management of the supply chain • Logistics **Supply Includes:** • API Manufacturing • DP Manufacturing and Packaging • Quality • EHS • Technical Functional Support • Logistics

Manufacturing at Big Pharma At a Glance

Our Network

- Order of a hundred of manufacturing sites
- 100 plus logistical centers

Products and Formulations

- Tens + technologies / technology platforms
- Tens of thousands of SKUs

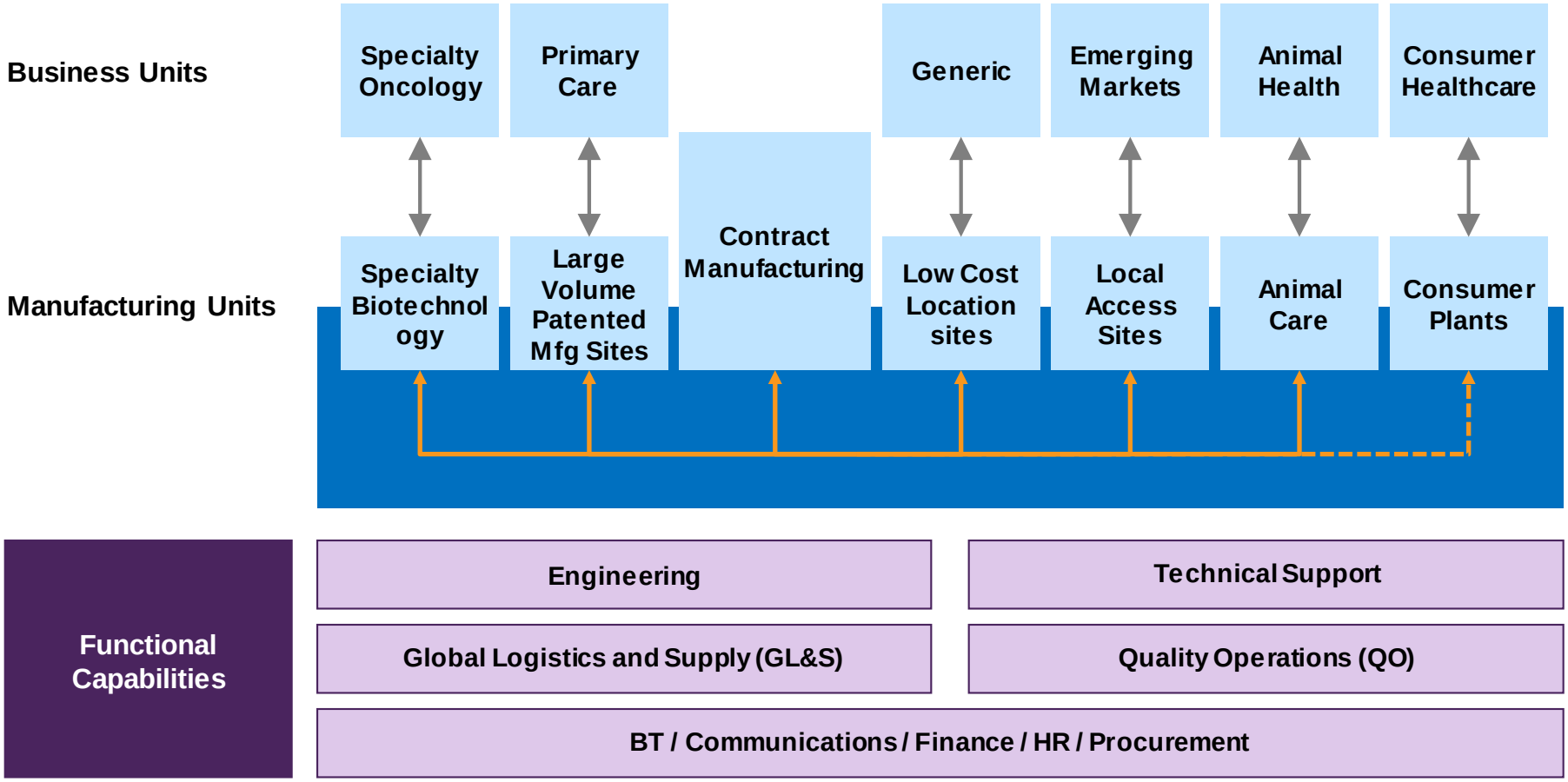
Key Activities

- Site and Logistics network
- Operational / Supply / Technical Support
- Partnership with stakeholders
- New Product Launches

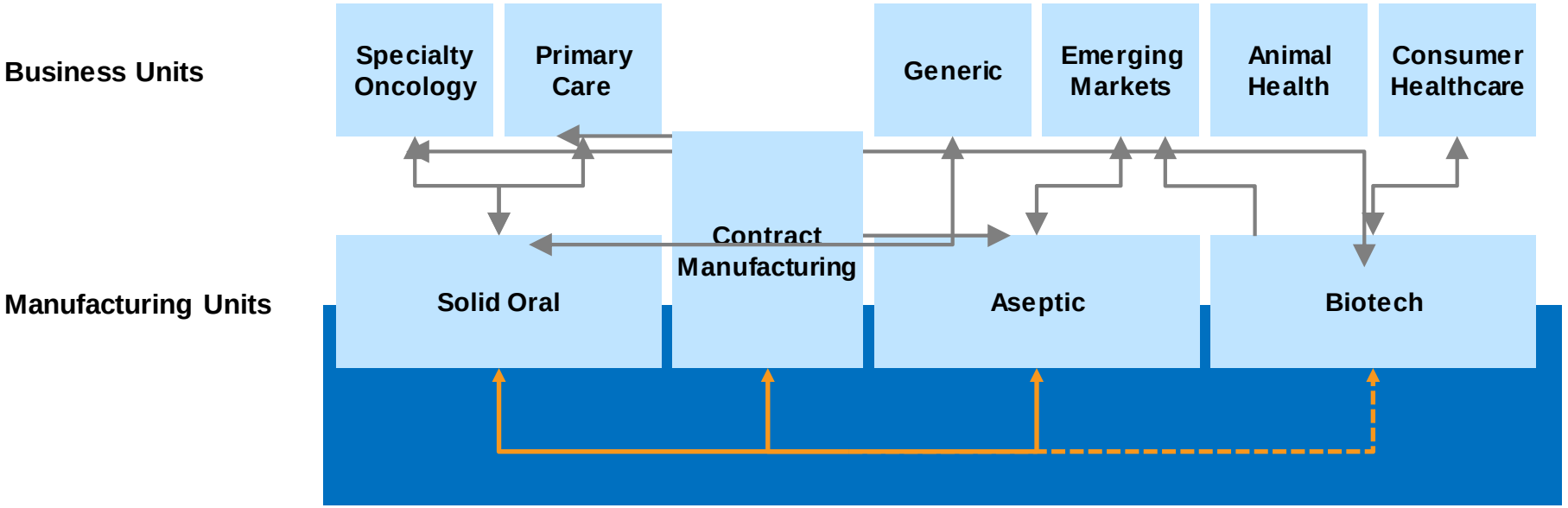
>175
Markets

>50
Languages

Different Manufacturing Frameworks: Customer Focused



Different Manufacturing Frameworks: Technology Based



Functional Capabilities		
	Engineering	Technical Support
	Global Logistics and Supply (GL&S)	Quality Operations (QO)
	BT / Communications / Finance / HR / Procurement	

Major Functions of a Global BioPharma Company (3/3)

Commercial Operations

- Marketing Organization working in parallel with R&D and Manufacturing from the start of any development
- Global Marketing Organization responsible for key market insights, market development, promotional and educational material, business development

What Is a "Successful" Drug

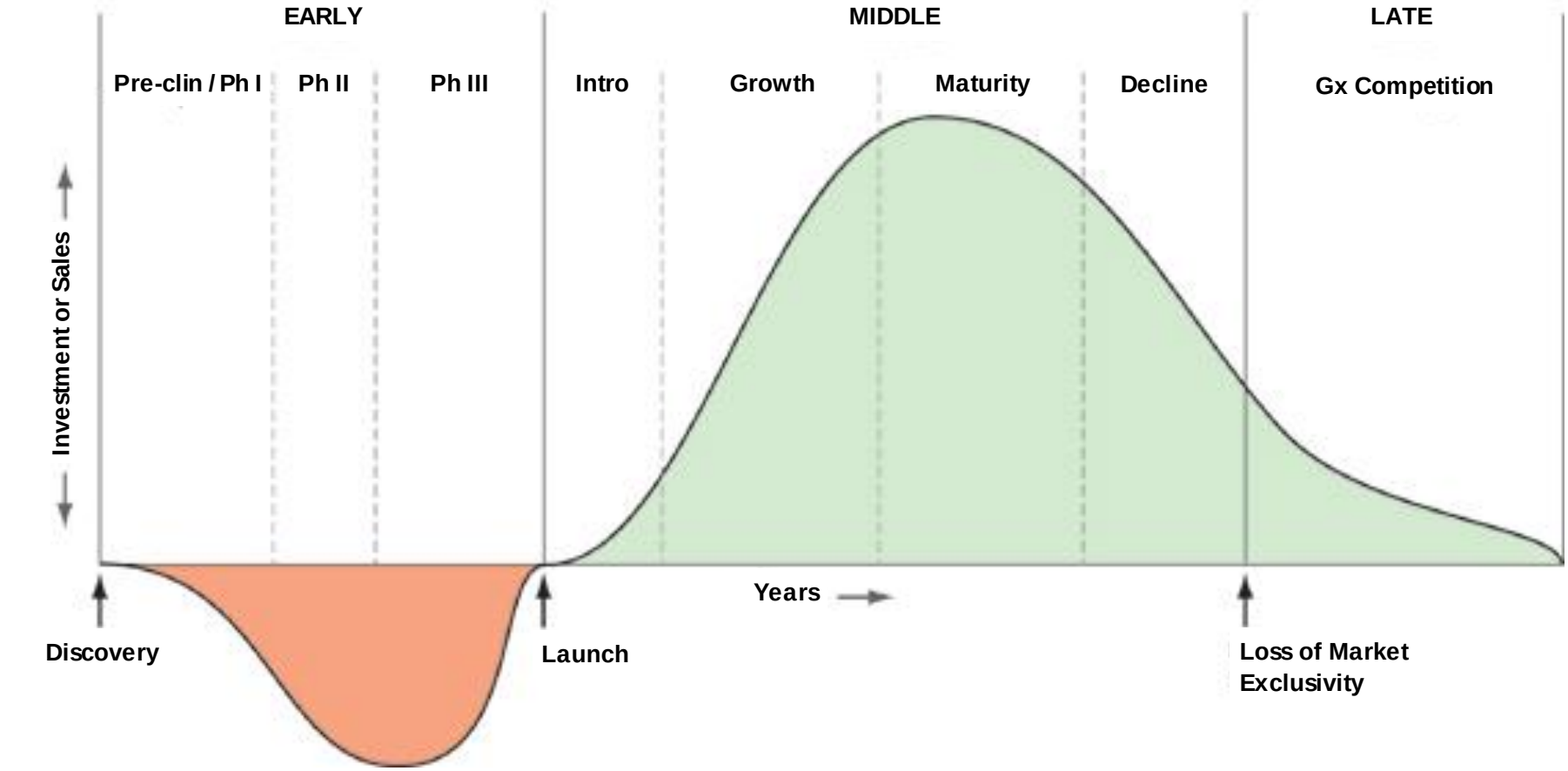
Criteria
Fills in Market Need
• New treatment to existing deceased • Better then existing treatments (better efficacy) • Better method of administration
Available When Needed
• Why so few drugs make it to the market?   • Yes, clinical, safety and efficacy, but what else? • Drugs are developed by cross functional teams. The cooperation between between marketing and manufacturing is a key to successful drug from the time of conception throughout the life cycle

AGENDA

- What determines large biopharmaceutical company classification
- What are the major functions, structures, and interdependencies in a large bipharma
- **Critical roles that marketing and manufacturing are playing in the early stages of drug development.**
- How to develop marketing forecast and manufacturing strategy during the uncertainty of Phase I and II in drug development

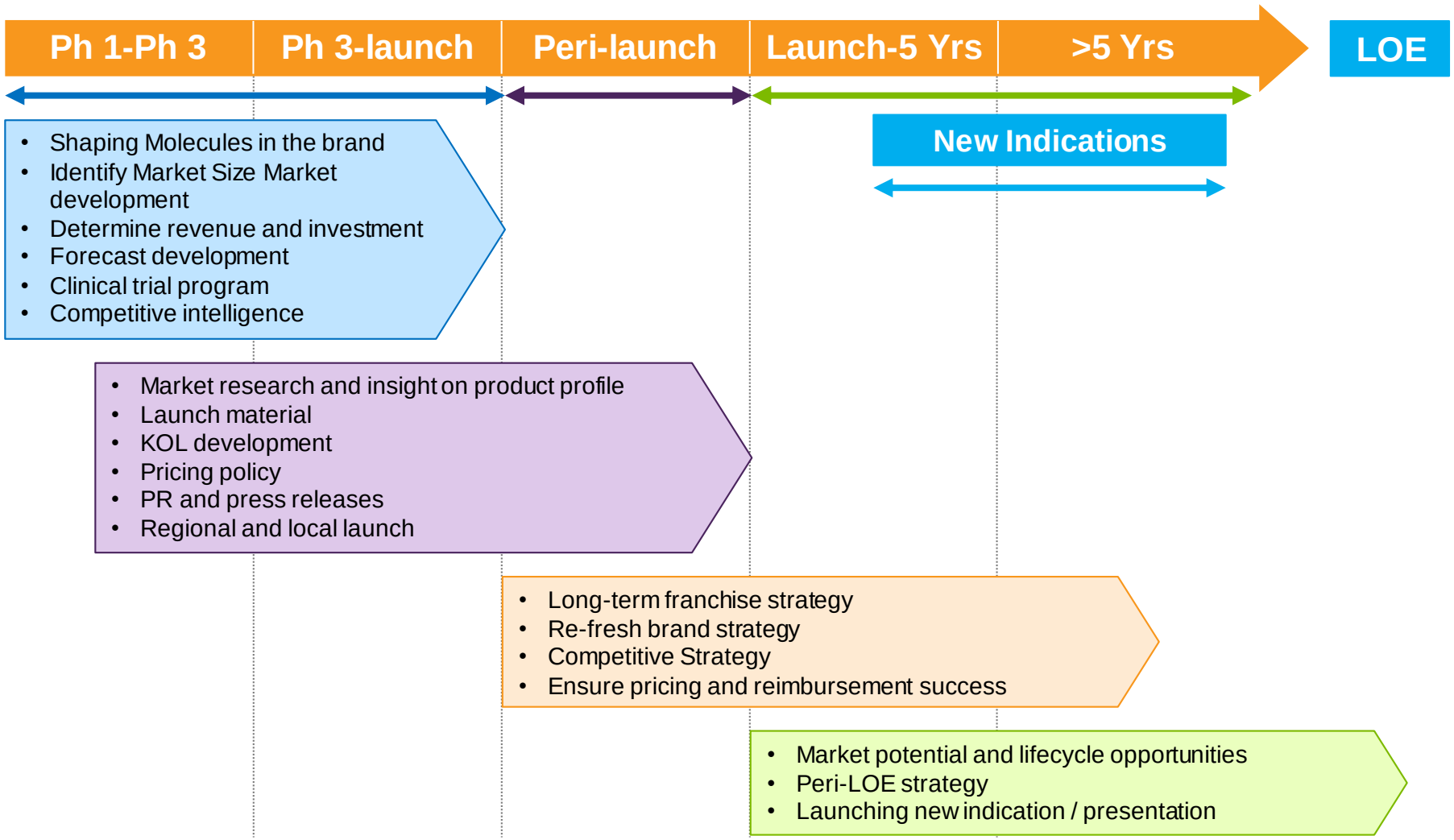
Pharmaceutical Product Life Cycle

Drug Life Optimisation: The Three Periods

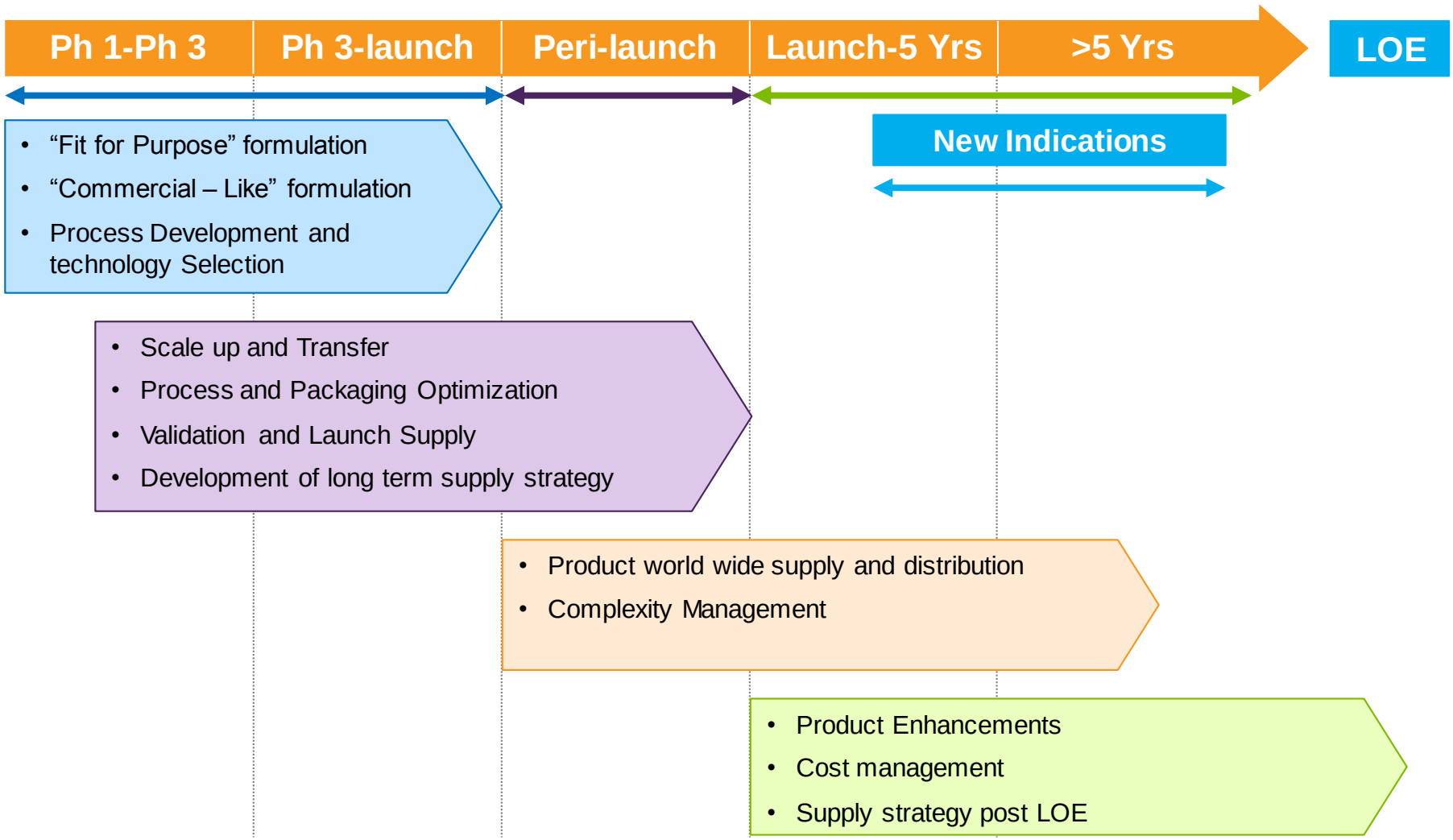


Source: http://www.medincell.com/market-segments/nce_formulation/lcm.

Level of Marketing Support Over Lifecycle of Asset



Level of Manufacturing Support Over Lifecycle of Asset



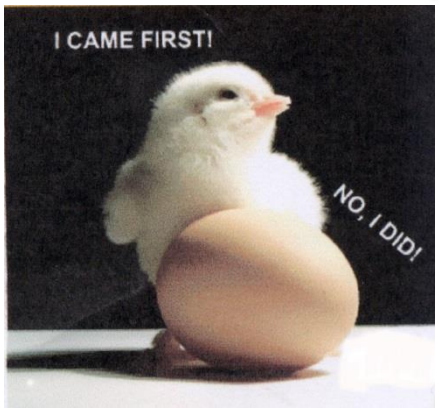
Phase I-Phase II Uncertainty

Marketing

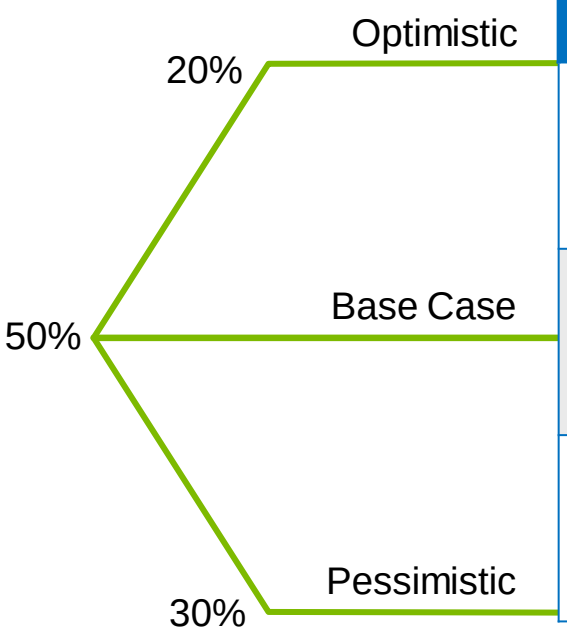
- How many patients can use the product?
- How much will it cost to manufacture?
- What price can we ask for this product?
- Cost of development?

Manufacturing

- What are going to be the volumes?
- What technology will be used?
- What packaging will be needed?
- What is the best way to source clinical trial/validation lots vs long term supply?



Anticipation of Different Outcomes and Their Evaluation



Other end points?

Dose	Safety	Tolerability	Patient Population	
QD	No Liver Function Test	No side effects	Patient with specific qualification	
BID	Liver function test 1/year	Side effects first 2–4 weeks	Treatment for Mild to moderate pain	
TID	Liver function test 4/year	Side effect throughout Trx	Treatment for moderate to sever pain	

Clinical Trials Calculation

CP: Intranasal Clinical Protocol Description				
	Phase I	**Phase II**	**Phase III**	
Efficacy Study Descriptions (Including Study #)	3 studies		*Pivotal Safety and Efficacy: 2 trials – 1* vs. sumatriptan pbo; 1 vs. pbo 50/50 US / EU	Long-term safety (using subset of pivotal study patients) US / EU
# Patients per Study (Specify #US, #EU, #Other)	24 per study		400 / EU per study 250 / US per study	500 / EU 500 / US
# Sites (Specify US, EU, Other)	1 site per study (EU)		80 / EU N/A / US	80 / EU N/A / US
Duration of Therapy / Study	N/A		1 attack (1 hr) / 9 months	12 months / 21 months
Description of Comp. Agents	N/A		(Sumatriptan) 20mg IN, pbo	Physician Optimized Treatment
Total Grant Cost per Study (Or Cost per Patient)	$120K per study		$10M	$3M
% Total Cost Spent in 1999	100%		$3M Total 23%	
Comments				
	Phase I	**Phase IIa**	**Phase IIb**	**Phase III**
Clinical Pharm Studies Total Number / % in 99	3/100%	%	%	%

AGENDA

- What determines large biopharmaceutical company classification
- What are the major functions, structures, and interdependencies in a large bipharma
- Critical roles that marketing and manufacturing are playing in the early stages of drug development.
- **How to develop marketing forecast and manufacturing strategy during the uncertainty of Phase I and II in drug development**

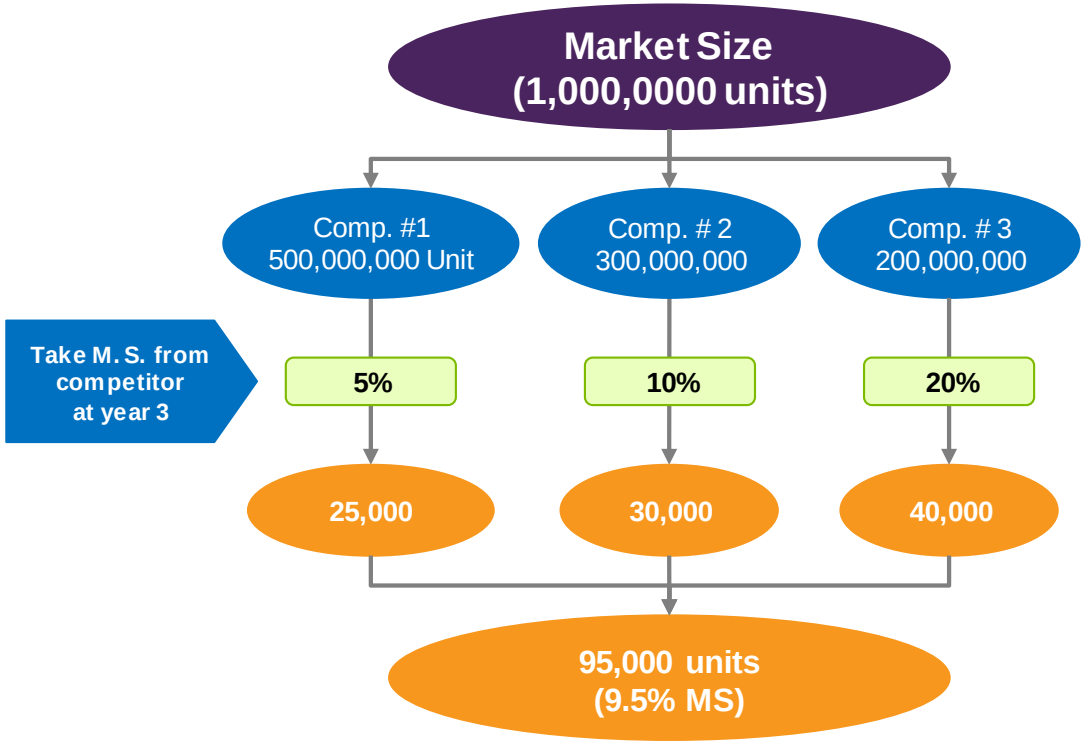
How to Develop Forecast for a New Molecule?

Two Methods:

1. Based on existing data for similar products
   - Revenues/volumes for all products for similar indication
   - Market share for each company selling similar products
   - Pricing for similar products
2. Based on epidemiology
   - Review epidemiology data for the decease
   - Develop assumptions for market share for our product

Building Forecast Based on IMS

- IMS – provide independent market information, including:
  - Total market (units and revenue)- Market Size
  - Company specific information – sales, SKUs, Market Share
  - Prescription information by diagnoses (available in selected markets)
  - Prescription information by physicians (available in selected markets)
- Variables that are necessary to build forecast:
  - Market Size
  - Number of competitors
  - Competitor's market share
  - Growth opportunity for therapeutic area
  - Differentiation of your product vs. competitor



Assumptions

Product Profile	Similar to Co #1
# of competitors	3
Market growth	3% / year
Launch in	4 years

Forecast Calculation Based on Existing Data

Commercial Output: Cash Flows						Launch Year		
Year		**-4**	**-3**	**-2**	**-1**	**1**	**2**	
Market X Financial Summary								
Total Market Size			1,000,000	1,030,000	1,060,900	1,092,727	1,125,509	1,1
Market Growth	3% / Year		3%	3%	3%	3%	3%	
Market Share	9.5% in 5 Y					2%	4%	
Units						21,855	45,020	
Price						7	7	
Revenue						152,982	315,142	4
Number of Markets Launching						10	12	
Global Revenue						1,529,818	3,781,710	6,8
Cost								
Cost of Good	$0.50					$546,364	$562,754	$5
Field Force	As % of Revenue					10%	10%	
FF Cost						$152,981.78	$378,170.96	$545
Direct Marketing	As % of Revenue					20%	20%	
DM Cost						$305,963.56	$756,341.92	$1,022
Clinical Trials		500,000	700,000	700,000	300,000			
Manufacturing		1,000,000	1,000,000	300,000				
Total Revenue						$1,529,818	$3,781,710	$6.8
Total Cost		1,500,000	1,700,000	1,000,000	300,000	$1,005,309	$1,697,267	$2.1
Cash Flow		(1,500,000)	(1,700,000)	(1,000,000)	(300,000)	$524,509	$2,084,442	$4.6

Cash Flow and NPV Calculation (2/2)

Questions: Should we invest $4.5M for the product with NPV = $46M

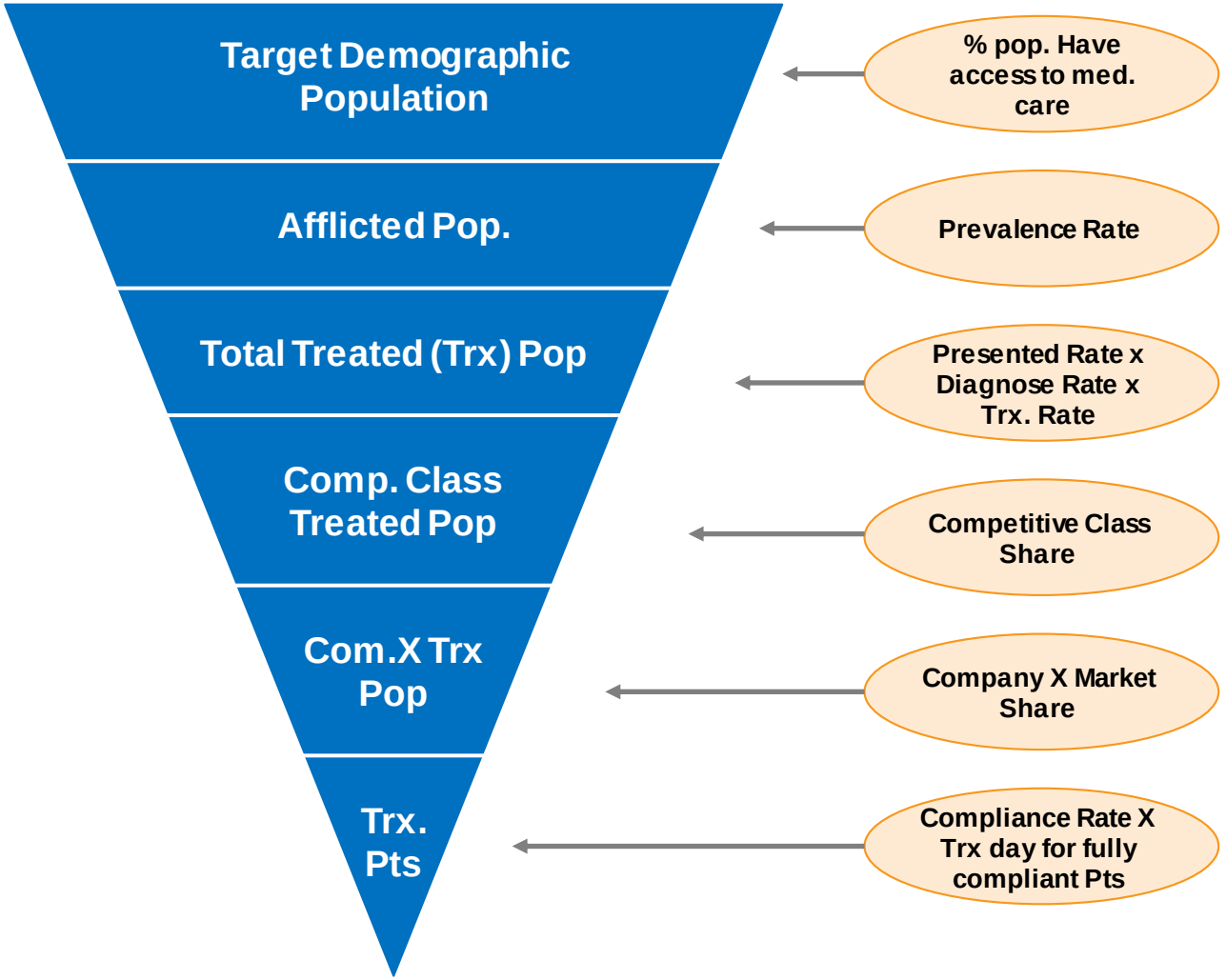
Commercial Output: Cash Flows								
Year	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Market X Financial Summary								
Total Market Size	1,194,052	1,217,933	1,242,292	1,267,138	1,292,481	1,318,330	1,344,697	1,371,591
Market Growth	3%	2%	2%	2%	2%	2%	2%	2%
Market Share	8%	10%	10%	10%	10%	10%	10%	10%
Units	89,554	115,704	124,229	126,714	129,248	131,833	134,470	137,159
Price	7	7	7	7	7	7	7	7
Revenue	626,877	809,926	869,604	886,996	904,736	922,831	941,288	960,114
Number of Markets Launching	15	19	20	25	28	30	30	30
Global Revenue	9,403,162	15,388,588	17,392,088	22,174,912	25,332,620	27,684,935	28,238,633	28,803,406
Cost								
Cost of Good	$597,026	$608,967	$621,146	$633,569	$646,240	$659,165	$672,348	$685,795
Field Force	8%	8%	8%	8%	8%	8%	8%	8%
FF Cost	$752,252.95	$1,231,087.02	$1,391,367.05	$1,773,992.99	$2,026,609.59	$2,214,794.77	$2,259,090.66	$2,304,272.48
Direct Marketing	10%	10%	8%	7%	6%	5%	5%	4%
DM Cost	$940,316.18	$1,538,858.78	$1,391,367.05	$1,552,243.87	$1,519,957.19	$1,384,246.73	$1,411,931.66	$1,152,136.24
Clinical Trials								
Manufacturing								
Total Revenue	$9,403,162	$15,388,588	$17,392,088	$22,174,912	$25,332,620	$27,684,935	$28,238,633	$28,803,406
Total Cost	$2,289,595	$3,378,912	$3,403,880	$3,959,806	$4,192,807	$4,258,207	$4,343,371	$4,142,204
Cash Flow	$7,113,567	$12,009,675	$13,988,208	$18,215,107	$21,139,813	$23,426,728	$23,895,263	$24,661,202
NPV	**$46,000,000**							

Pfizer больше чем

Building Forecast Based on Epidemiology Model

New Product to Trx
Gambling addiction

- Population: 300,000,000
- Prevalence = 2%
- Presented Rate = 20%
- Dx rate = 70%
- Treatment rate = 50%
- Competitive class Market Share:
  - Old class – 60%
  - New Class 40%
- Company X Market Share at peak 20%
- Compliance rate = 30%
- Trx day= 365 day



Forecast Calculation Based on EPI Data

	Period Year	1 2015	2 2016
Market Size Original			
Demographic Population	Kpeople	300,000	300,000
Prevalence / Incidence Rate	Percent	2.0%	2.0%
Afflicted Population	Kpeople	6,000	6,000
Presenting Rate	Percent	20.0%	20.0%
Diagnosis Rate	Percent	70.0%	70.0%
Treatment Rate	Percent	50.0%	50.0%
Total Patient Population	Kpatients	420	420
Basic Competitive Class Share	Percent	40.0%	40.0%
Effect of Class Event	None	1.0	1.0
Competitive Class Share	Percent	40.0%	40.0%
Comp. Class Treated Population Original	**Kpatients**	**168**	**168**
Market Share Original			
Co.X Market Share Original	Percent	5%	6%
Our Market			
Co. xPatients, Original Alone	Kpatients	8	10
Total Therapy Days, Original Alone	Mtherapy-days	365.0	365.0
Revenue			
Co. X Price, Original	$ / Therapy Day	7.00	7.00
Co. X Sales Volume, Original Alone	(M) Units	3066.0	3679.2
Co.X Revenue, Original Alone	($M)	21,462	25,754
Incremental Pfizer Revenue	**($M)**	**21,462**	**25,754**

Pfizer больше чем

Cash Flow and NPV Calculation Based on EPI Data (1/3)

Asset Valuation Model EU														
	Period Year	1 2015	2 2016	3 2017	4 2018	5 2019	6 2020	7 2021	8 2022	9 2023	10 2024	11 2025	12 2026	13 2027
Market Size Original														
Demographic Population	Kpeople	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
Prevalence / Incidence Rate	Percent	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Afflicted Population	Kpeople	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
Presenting Rate	Percent	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Diagnosis Rate	Percent	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%
Treatment Rate	Percent	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Total Patient Population	Kpatients	420	420	420	420	420	420	420	420	420	420	420	420	420
Basic Competitive Class Share	Percent	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Effect of Class Event	**None**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**
Competitive Class Share	Percent	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Comp. Class Treated Population Original	**Kpatients**	**168**	**168**	**168**	**168**	**168**	**168**	**168**	**168**	**168**	**168**	**168**	**168**	**168**
Market Size Original														
Co.X Market Share Original	**Percent**	**5%**	**6%**	**10%**	**15%**	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**

Cash Flow and NPV Calculation Based on EPI Data (2/3)

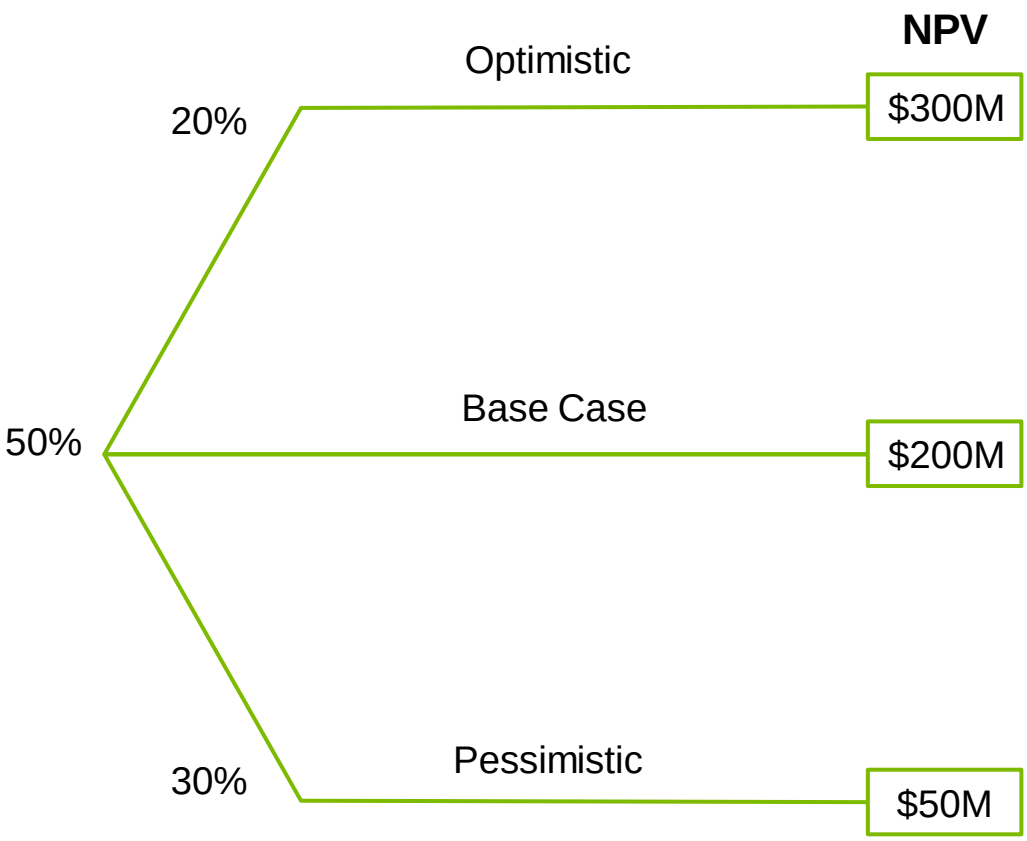
Asset Valuation Model EU														
	Period Year	1 2015	2 2016	3 2017	4 2018	5 2019	6 2020	7 2021	8 2022	9 2023	10 2024	11 2025	12 2026	13 2027
Our Market														
Co. xPatients, Original Alone	Kpatients	8	10	17	25	34	34	34	34	34	34	34	34	34
Total Therapy Days, Original Alone	Mtherapy-days	365.0	365.0	365.0	365.0	365.0	365.0	365.0	365.0	365.0	365.0	365.0	365.0	365.0
Revenue														
Co. X Price, Original	$ / therapy day	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Co. X Sales Volume, Original Alone	Units (M)	3066.0	3679.2	6132.0	9198.0	12264.0	12264.0	12264.0	12264.0	12264.0	12264.0	12264.0	12264.0	12264.0
Co.X Revenue, Original Alone	($M)	21,462	25,754	42,924	64,386	85,848	85,848	85,848	85,848	85,848	85,848	85,848	85,848	85,848
Incremental Co.X Revenue	**($M)**	**21462**	**25754**	**42924**	**64386**	**85848**	**85848**	**85848**	**85848**	**85848**	**85848**	**85848**	**85848**	**85848**
Cost of Goods														
Cost of Goods, Original Alone	($M)	1.5	1.8	3.1	4.6	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
COGS = $0.5 / tablet														
Incremental COGS	**($M)**	**1.5**	**1.8**	**3.1**	**4.6**	**6.1**	**6.1**	**6.1**	**6.1**	**6.1**	**6.1**	**6.1**	**6.1**	**6.1**

Quiz

Market Size	100M pts
Market Growth	5% / year
No. of Competitors	4
Market Shares	1 = 35%
	2 = 25%
	3 = 20%
	4 = 20%
Our Product Profile	=comp #2
Price	$5

Calculate 5 years forecast

Financial Calculation for Overall Program

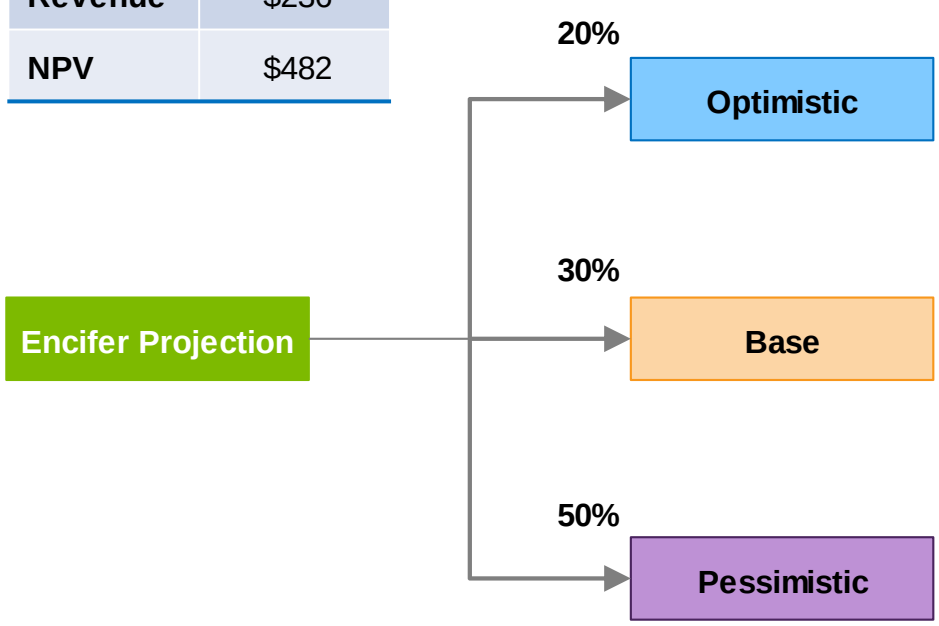


Expected Value Calculation

300 x 0.2+200 x 0.5 + 50 x 0.3 = **$175**

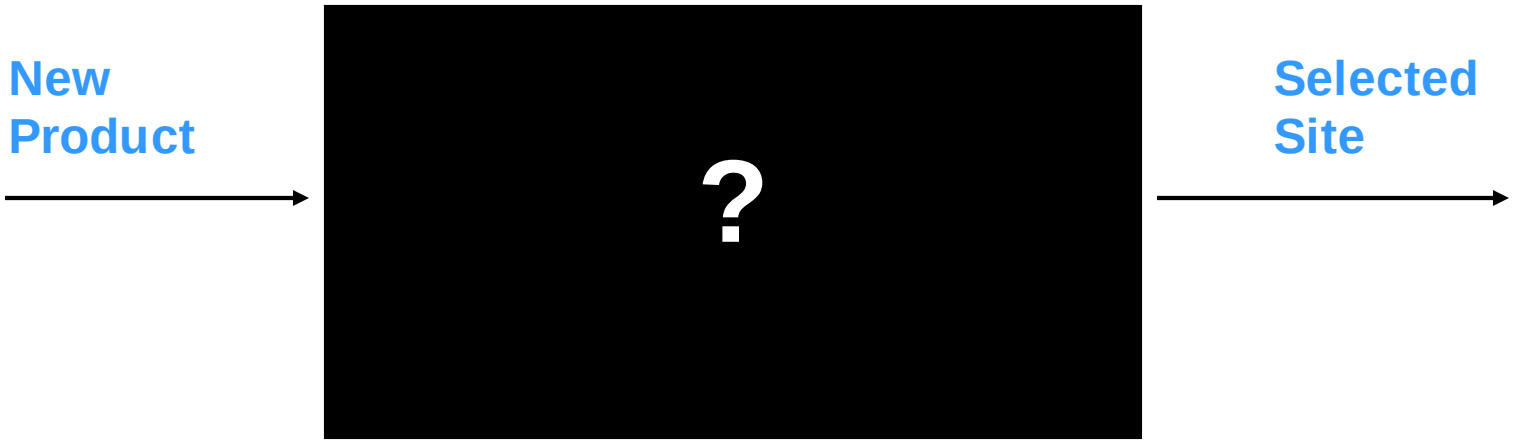
Example: Summary of the Analyses

Expected Value	
Revenue	$236
NPV	$482



Commercial Scenarios		
5th Year WW Sales	NPV @ COGS = $3 Relatisitc	NPV @ COGS = $2 Optimistic
$591	$1,822	1,979
$232	$621	715
$96	$208	257

Sourcing Process?



What is the best sourcing strategy for a company?

Pfizer больше чем

Sourcing Strategy Guiding Principle

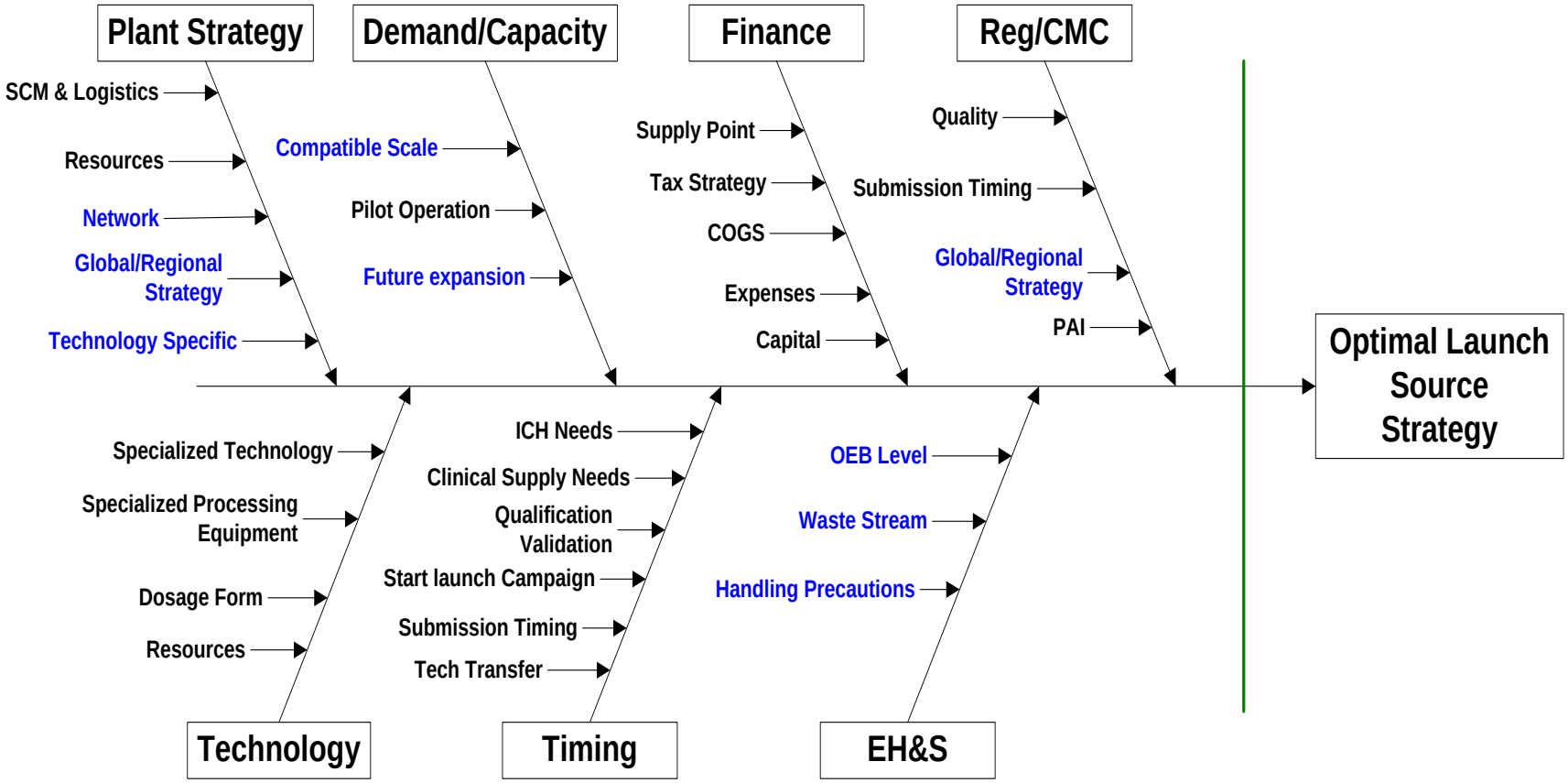
Goal is to identify best value for a Company?

Value= f (Business, Regulatory, Technical)

- Business
  - Minimize capital investment
  - Align investments with key project milestones (clinical, regulatory, and commercial)
  - Defer spends as much as possible
  - Control spend (flexibility)
- Regulatory
  - Minimize regulatory risk for approval
    - Clinical strategy
    - ICH/launch strategy
  - Minimize regulatory risk for commercial success
- Technical
  - Best technical option with least trade-offs on regulatory and business factors

Seek the best overall value

Influencing Factors in Fit Analysis

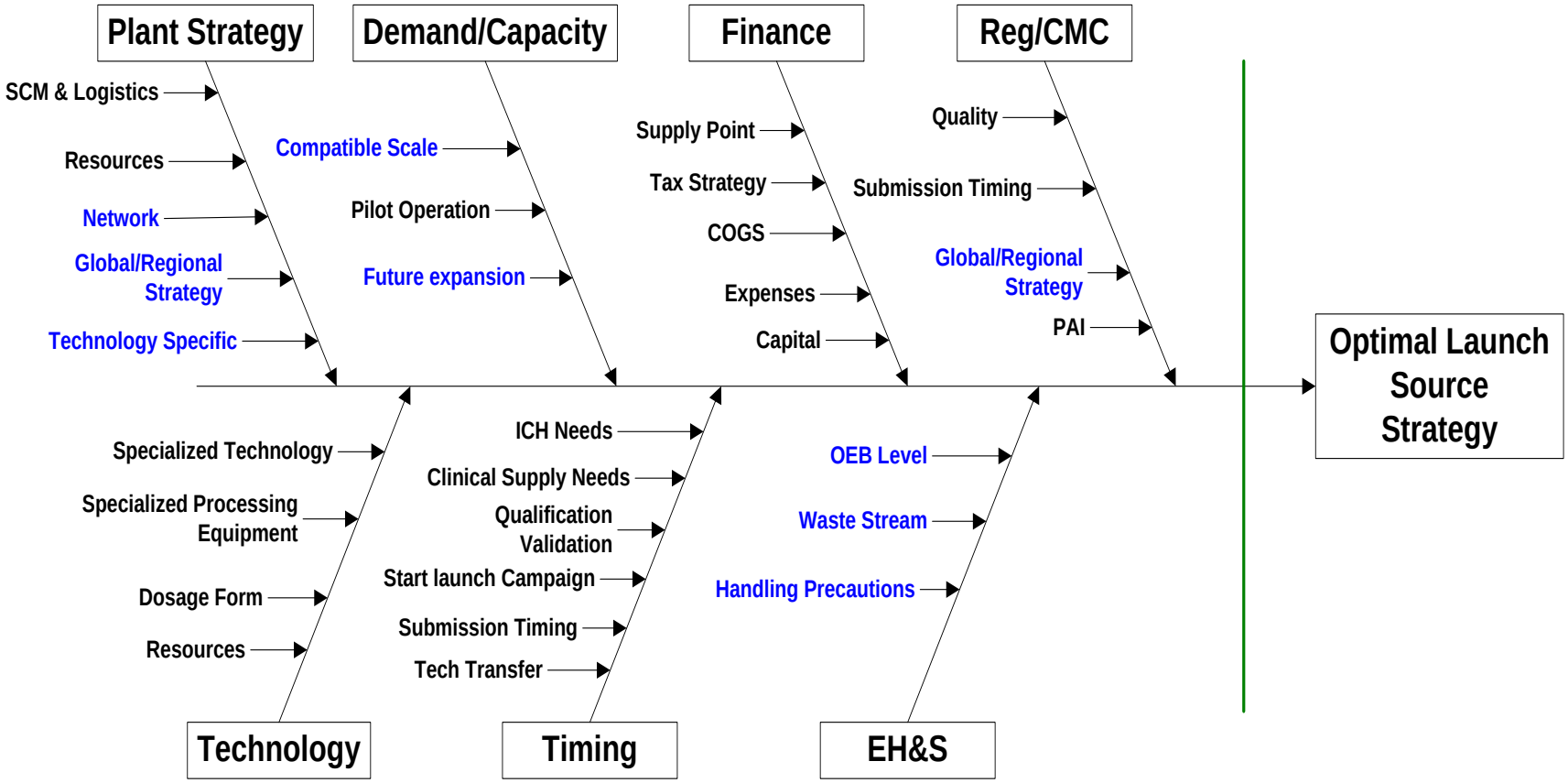


Sourcing Strategy - DP

- Generally, if core technology-should consider sourcing in house

- Examples of Core Technologies:
  - Tablets
  - Coated tablets
  - Hard fill capsules
  - Osmotics
  - Oral solutions
  - Oral suspensions
  - Powder for oral suspensions
  - Topical solutions
  - Sterile solutions in vials, ampoules and pre-filled syringes
  - Sterile suspensions in vials, pre-filled syringes
  - Lyophilization in vials

Influencing Factors in Fit Analysis



Case Study

- Extended release tablet
- Acquired through acquisition of small company
  - Peak volumes of approximately 40 M tablets, with peak sales of $300-500M
  - Currently only intended for US market but commercial is evaluating options for EU and ROW
  - OEB 4 compounding
  - ICH batches made at contractor
  - Sourcing Need: Encapsulation and packaging site

Pfizer больше чем

Outline Advantages/Risks to Each Scenario

Scenario 1

- Source from company's internal site with OEB 4 capability

Scenario 2

- Source from another US site with no current OEB 4 Capability

Scenario 3

- Source from ICH contractor who has existing OEB 4 infrastructure [

Which option would you choose for launch site for encapsulation and packaging? Would you employ a different strategy 3 years post launch?

Launch Options

1. Source from company's internal site with OEB 4 Capability
   - Advantage: Technically sound; no capital required; good COGs
   - Risk: Technical transfer/BE required; logistics
2. Source from another US site with no current OEB 4 Capability
   - Advantage: Low commercial COGs; logistically aligned
   - Risk: Technical transfer/BE required; capital investment of $2M for Schedule II infrastructure for Schedule II
3. Source from ICH contractor who has existing OEB 4 infrastructure
   - Advantage: No technical transfer (ICH site), no capital investment
   - Risk: Higher COGs than internal options

Conclusion

Ask the class

- What classifies large biopharma company?
- What are the major functions, structures, and how are they interdepend?
- What is the marketing role in the early stages of drug development?
- What is the manufacturing role in the early stages of drug development?
- How many forecast models are there and what are they (describe)?
- What are the key parameters in the sourcing process?